Food Living Outside Play Technology Workshop

Forge / Furnace Propane Jet Burner

by **n1cod3mus** on June 26, 2014

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Author:n1cod3mus Chris Fry Design
One day I shall own a Delorean.

Intro: Forge / Furnace Propane Jet Burner

Building a Propane burner for a forge or furnace.

I wanted to revisit my aluminum foundry, previously I had it running on charcoal which turned out to be messy and expensive and in the UK its hard to get charcoal in the winter.

I decided I needed to build a propane burner as propane is available all year round from multiple places and can even be delivered. Its clean and fairly cheap once you have paid for the cylinder.

I have looked around at various designs and i have settled on the

EZ Burner (Easy Burner) designed by Ron Reil, originally designed for a forge it would be suitable for a furnace. The EZ burner is an adaptation of Ron Reil's original burner, the main difference is the end is not flared which would have to be done by heating the end up and hammering it on an anvil. This would require a forge, which I don't have, I could have flared it using an improvised forge using bricks and charcoal but I figured i would just try the EZ Burner and see if it was powerful enough and it seems to be.

Check out this video of it working.

my plan for this burner is to put it in a new Furnace so I can melt aluminum and copper and cast it.

Image Notes
1. nice blue flame

Step 1: Parts and tools

parts

1 1/2" to 3/4" malleable steel reducer

3/4" 300mm malleable steel pipe threaded at both ends, though you only need the thread at one end.

1" malleable steel pipe, I ended up with one that was threaded at both ends

1 1/2" short threaded malleable steel pipe, I ended up with one threaded at both ends.

8mm x 200mm malleable steel pipe

tools

1mm drill bit

drill

hammer

center punch

Hack saw or other steel saw, my mitre saw can cut steel so I used that

Propane gas bottle

High pressure propane regulator

Gloves and goggles for protection

Image Notes
1. Mitre saw that can cut steel

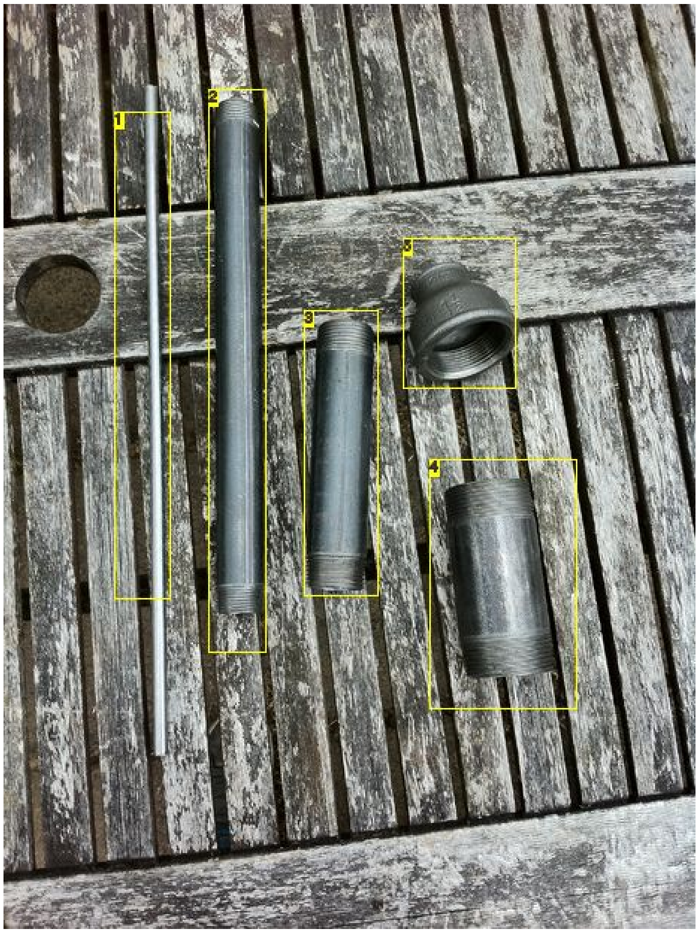


Image Notes
1. 8mm pipe
2. 3/4" pipe
3. 1" pipe
4. 1 1/2" Pipe
5. 1 1/2" to 3/4" bell reducer

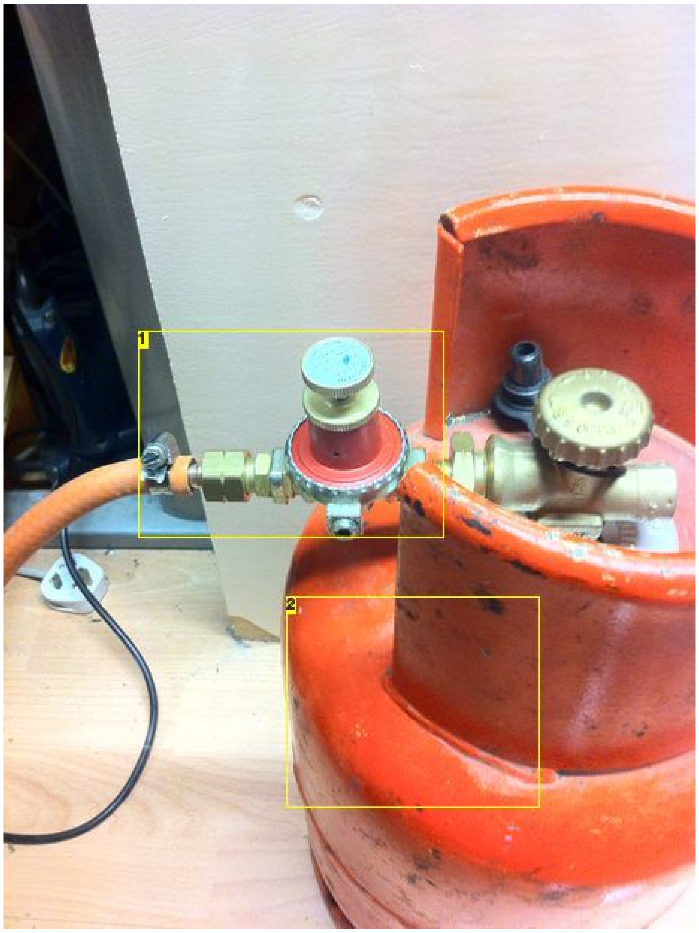


Image Notes
1. High Pressure Propane Regulator
2. Propane Gas bottle

Image Notes
1. center punch
2. Hammer

Image Notes
1. Drill

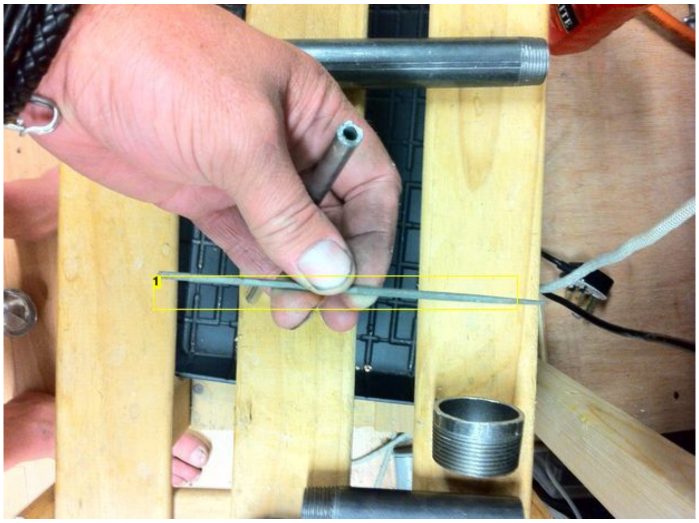


Image Notes
1. Round file

Image Notes
1. gloves
2. goggles

Step 2: Design and theory

The design of the original burner you can see in the image I have attached, on Ron Reils website he doesn't show pictures but describes the EZ burner. He also goes through how the burner works.

http://ronreil.abana.org/ezburner.shtml

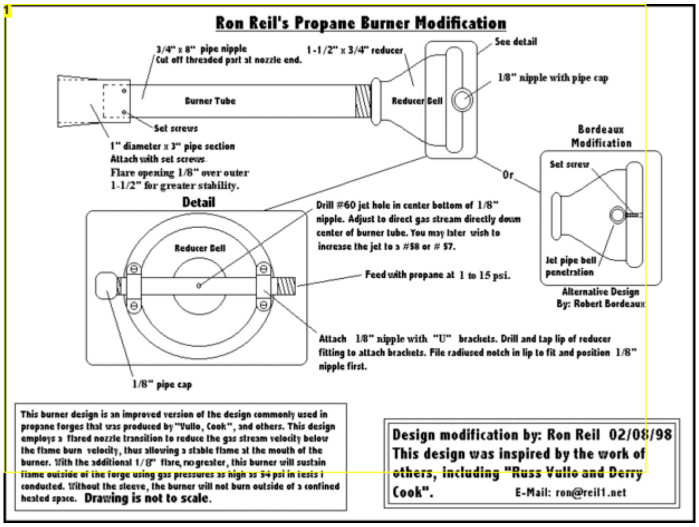
The idea is that by having a reducer at one end with a pipe between and then opening up again at the other end it creates a vacuum, known as the venturi effect, which draws air in from the back so it burns the gas properly.

you can read more on the venturi effect on this wiki page

http://en.wikipedia.org/wiki/Venturi_effect

what we are aiming for is a nice blue flame, a yellow flames says the fuel is not all being burned and its not burning efficiently. A blue flame says its all being burnt and as such is much hotter than a yellow flame.

you can get a better hotter flame by flaring the end of the pipe, but for what I need its not needed.



Drill #60 jet hole in center bottom of 1/8" nipple. Adjust to direct gas stream directly down center of burner tube. You may later wish to increase the jet to a #58 or # 57.

Attach 1/8" nipple with "U" brackets. Drill and tap lip of reducer fitting to attach brackets. File radiused notch in lip to fit and position 1/8" nipple first.

This burner design is an improved version of the design commonly used in propane forges that was produced by "Vullo, Cook", and others. This design employs a flared nozzle transition to reduce the gas stream velocity below the flame burn velocity, thus allowing a stable flame at the mouth of the burner. With the additional 1/8" flare, no greater, this burner will sustain flame outside of the forge using gas pressures as high as 94 psi in tests I conducted. Without the sleeve, the burner will not burn outside of a confined heated space. **Drawing is not to scale.**

Design modification by: Ron Reil 02/08/98
This design was inspired by the work of others, including "Russ Vullo and Derry Cook". E-Mail: ron@reil1.net

Image Notes
1. Image found on google images

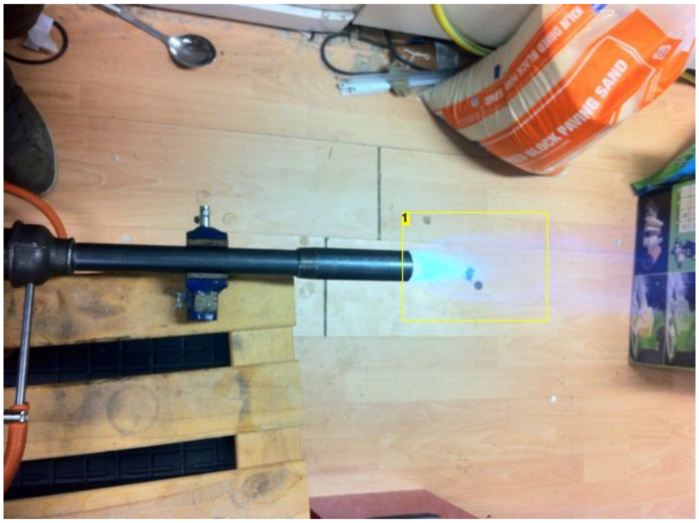


Image Notes
1. nice blue flame

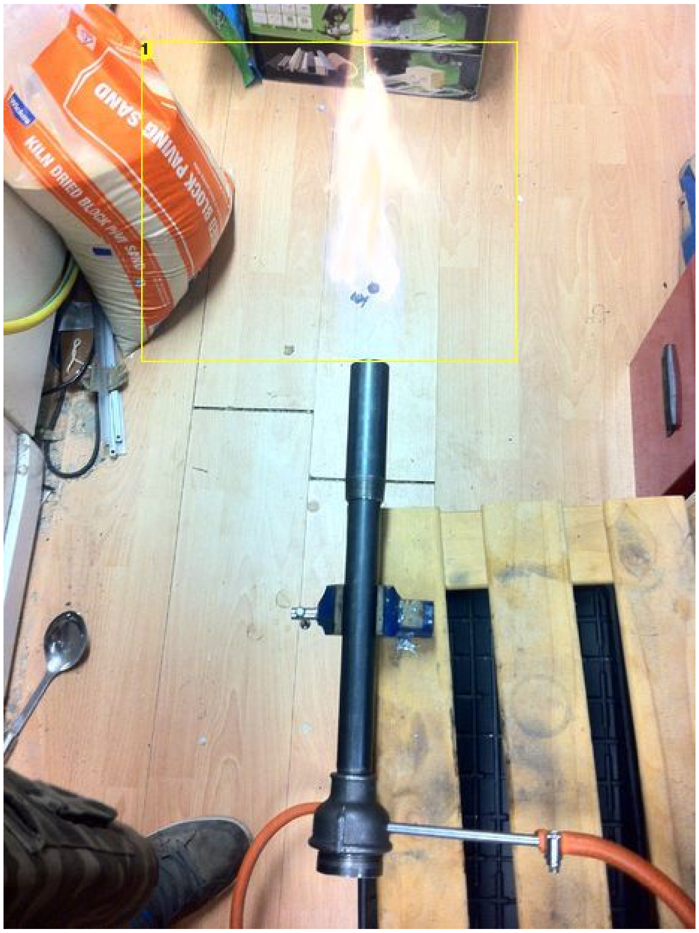


Image Notes
1. yellow flame, this is not what we want, it means its not burning the fuel properly

Step 3: Cutting the pipes

All we need to do here is cut the ends off a couple of pieces as we don't need the threads on one end.

the 1" pipe I cut the end off, this will form the end nozzle of the burner.

and I cut a piece off the end of the 1 1/2" pipe, but in this case I need the short piece, I will use this later in the reducer to hold the gas pipe in place.

The 8mm pipe I bought was 400mm long so I had to chop that in half.

Image Notes
1. gloves and eye protection

Image Notes
1. Mitre saw for cutting steel

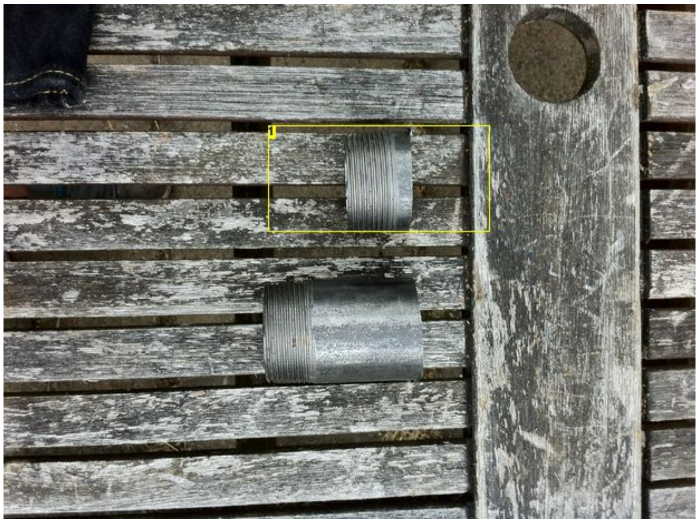
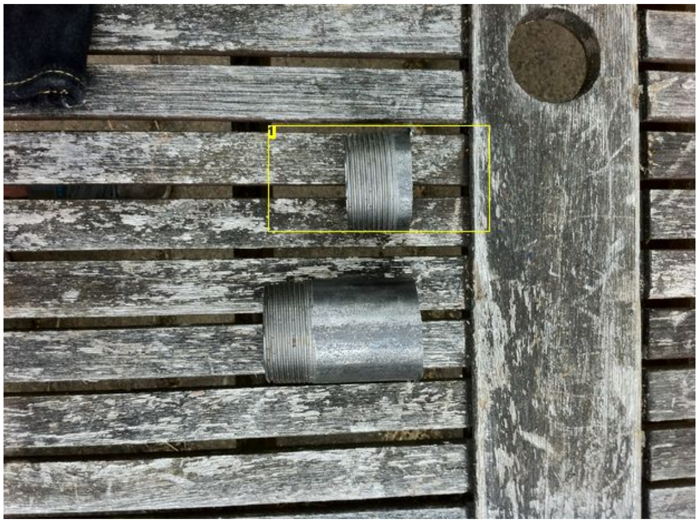


Image Notes
1. this part of the 1 1/2" pipe will be used to clamp the gas feed



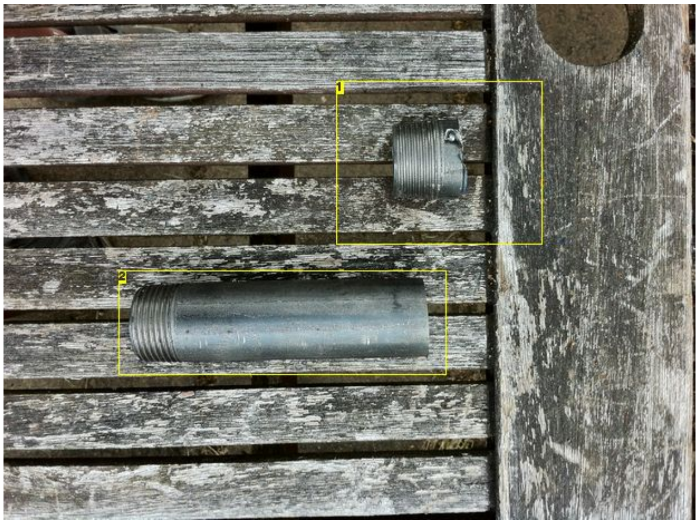


Image Notes
1. don't need this bit of the 1" pipe
2. 1" pipe, this will be the nozzle

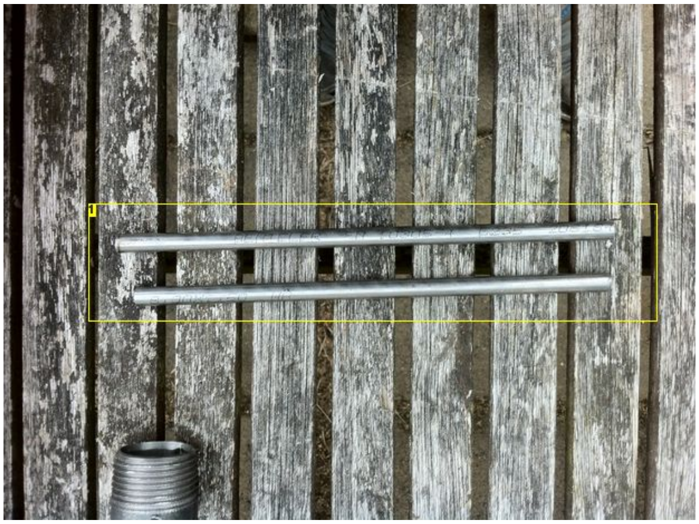


Image Notes
1. cut the 8mm pipe to 200mm long

Step 4: Perparing the gas pipe and reducer

I welded one end of the 8mm pipe shut so that gas wont escape, you could use an end cap. A lot of people use a brass pipe for their gas feed.

I then made a mark on the 8mm pipe which marks the width of the reducer from the welded end, then half way along I drilled a 1mm hole. When you drill in to metal your bit can slip so its best to use a center punch and a hammer to put a little dent where you want the hole, this will help to stop the bit from slipping. be careful with the 1mm drill bits they are very brittle and be snapped very easily.

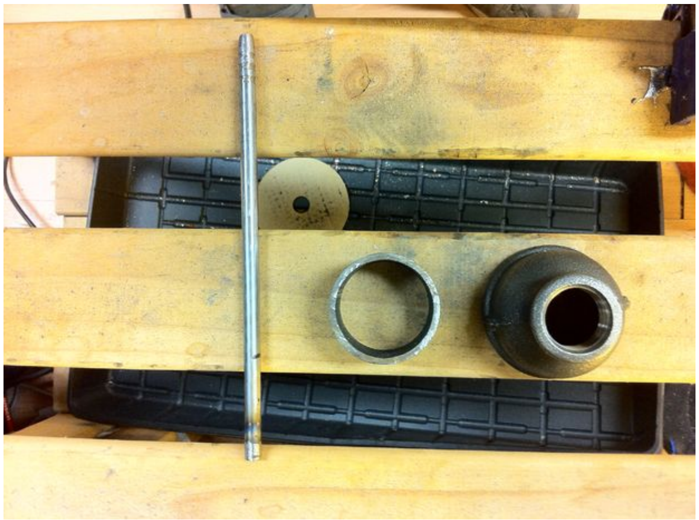
I used a bench grinder to put ridges on one end of the 8mm pipe so that when I clamp the gas line on it will hold and not pop off with pressure.

I then needed a 8mm hole on either side of the reducer so the gas feed pipe can go through, but I need it far enough down so that I have some of the inside thread I can use to put some pipe in to clamp the gas feed in place.

Fortunately the manufacturers have put a mold seam through the middle which you can use to work out where the middle is on each side. I put the reducer on some paper/card and put marks where the seam lines where, then rotated the reducer and used those marks to mark the reducer. From those lines I just made a mark further down on each side. Center Punched and drilled the holes.

It pays to use some files on the holes and the cut ends of the pipes so you don't cut your hands.

Now its just a case of putting it all together, the welded end of the 8mm pipe should be flush with one hole, then screw in the 1 1/2" off cut of pipe by hand just tight enough to hold the pipe in place.



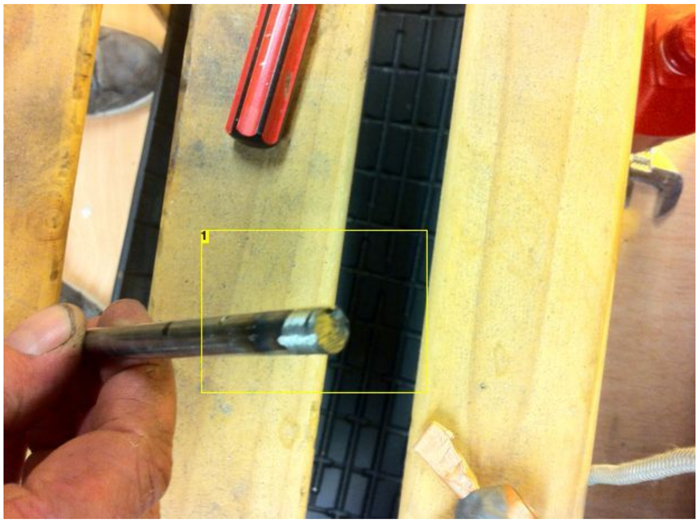


Image Notes
1. welded the end of the 8mm pipe

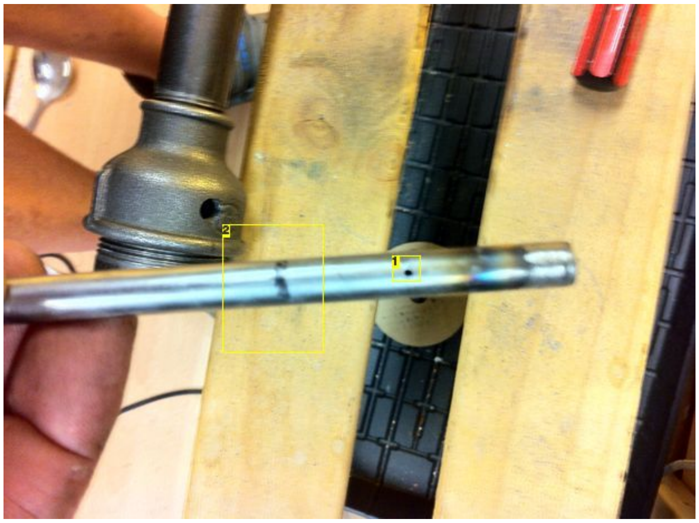


Image Notes
1. 1mm Hole
2. mark to show width of the reducer

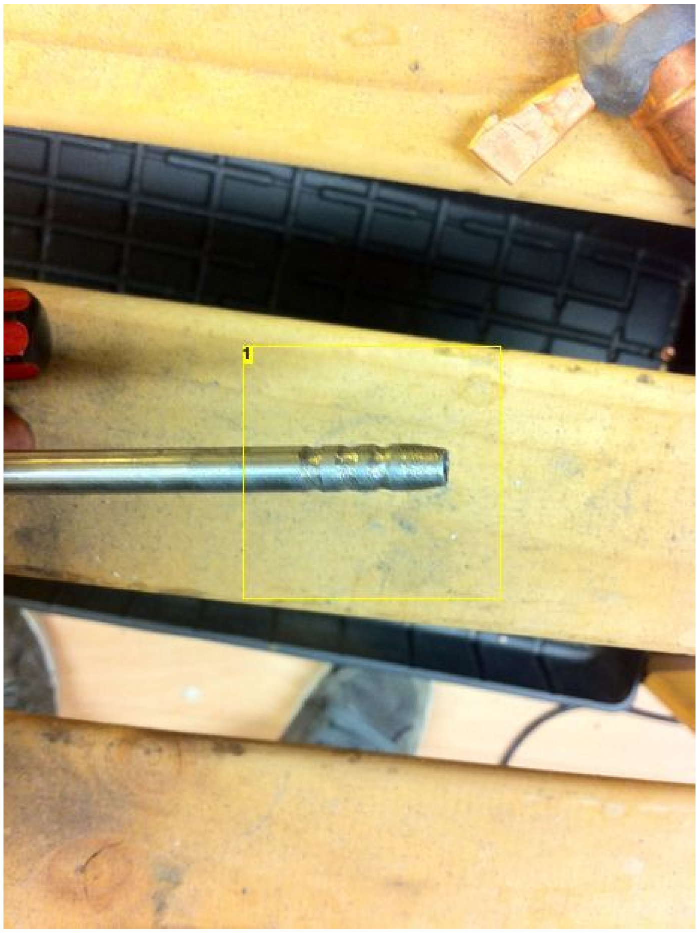
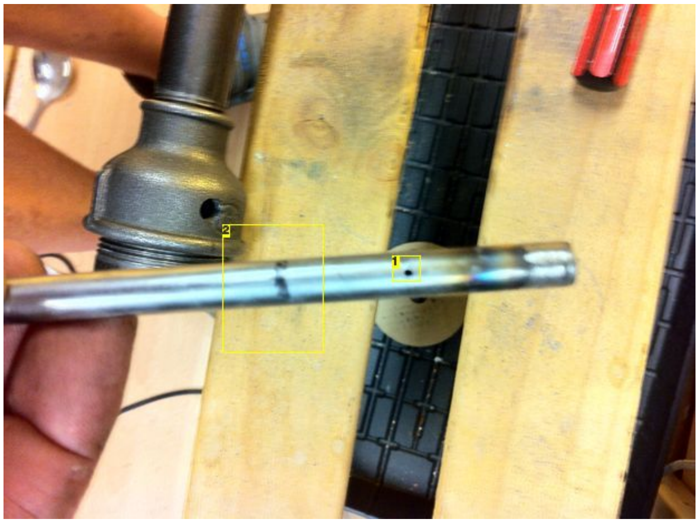


Image Notes
1. put notches int he pipe to hold the rubber gas line



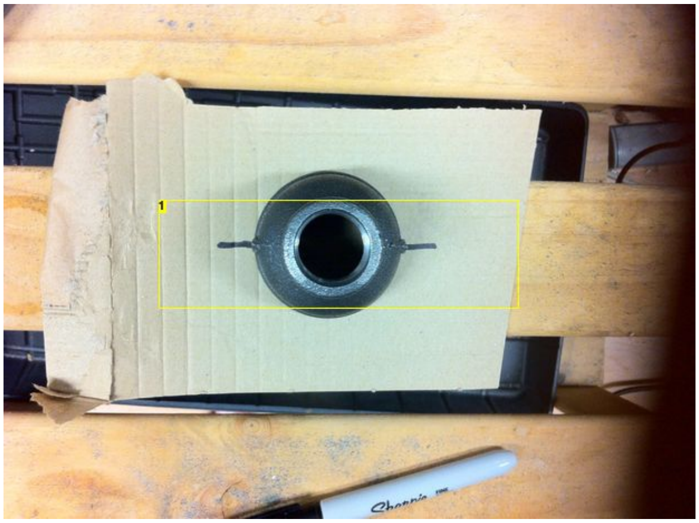
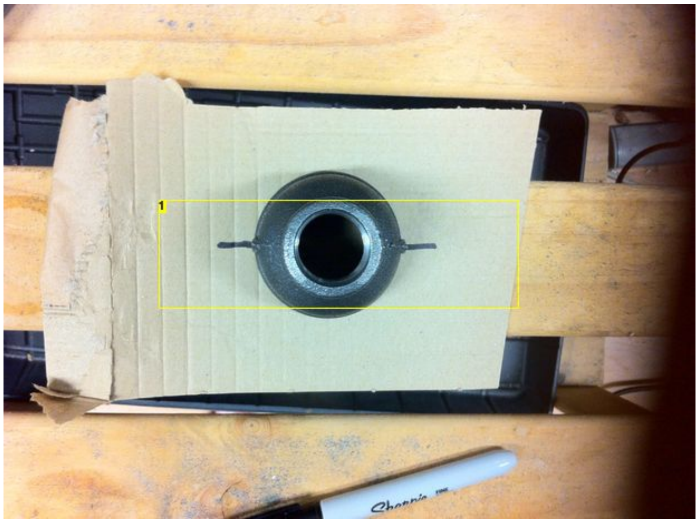


Image Notes
1. using the mold lines to make the centers



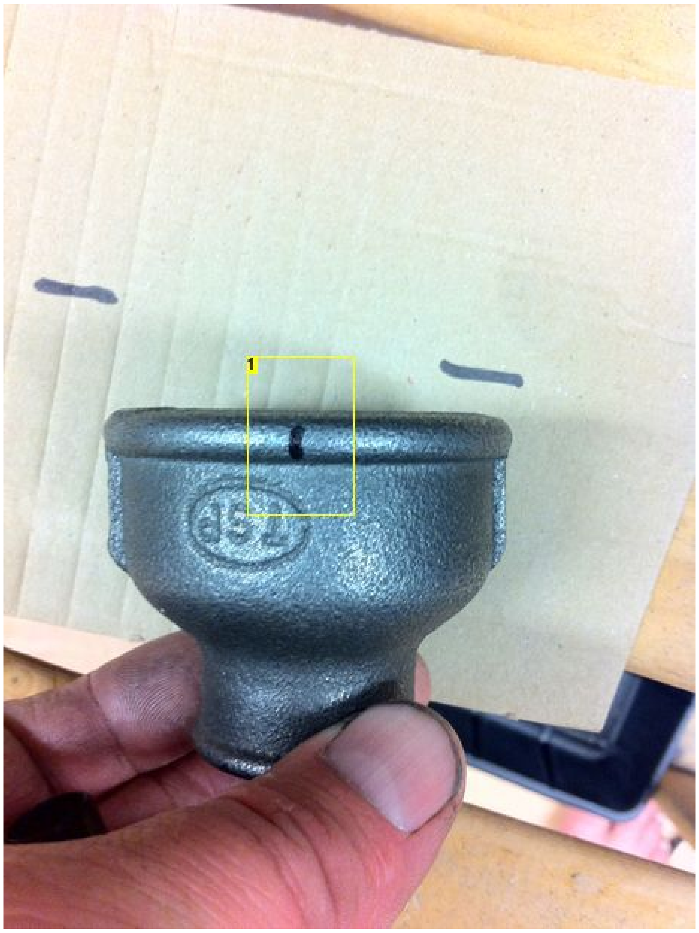


Image Notes
1. the center of the side of the reducer

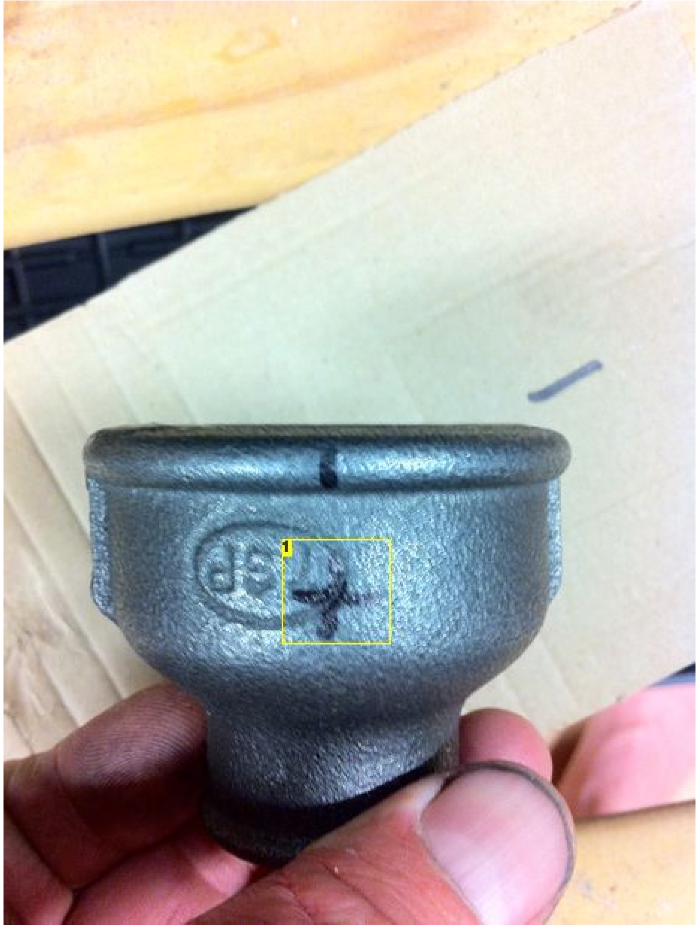


Image Notes
1. this is where I will be drilling

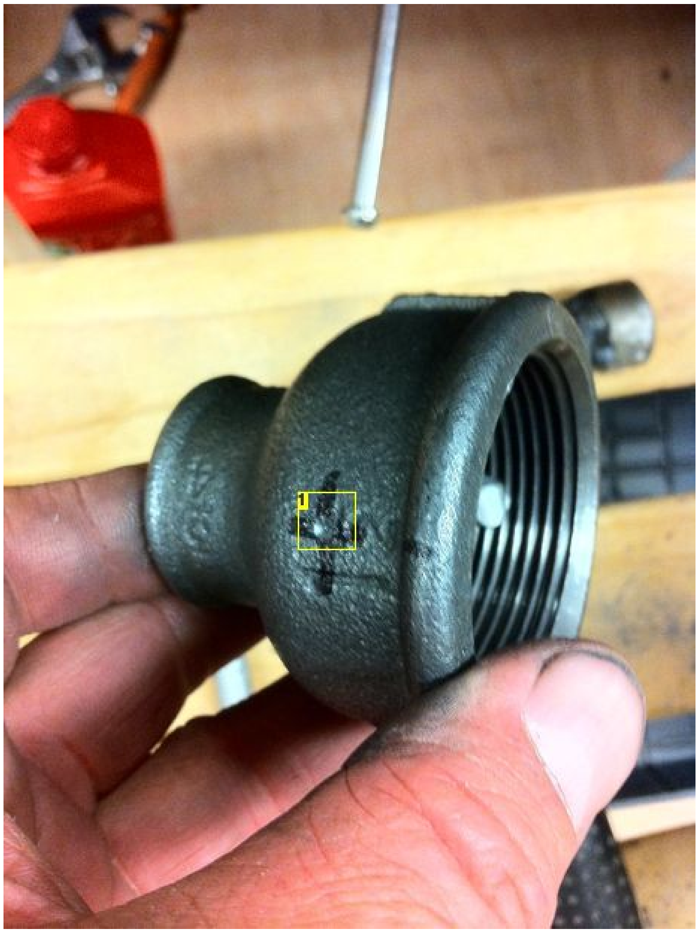


Image Notes
1. a dent from the center punch ready to drill

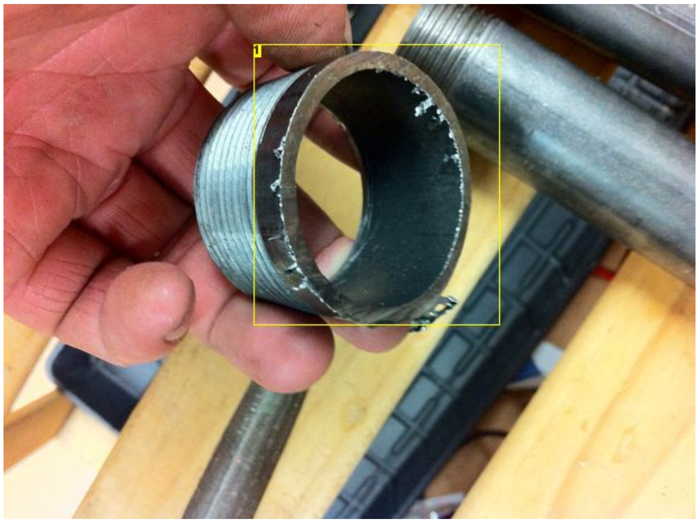
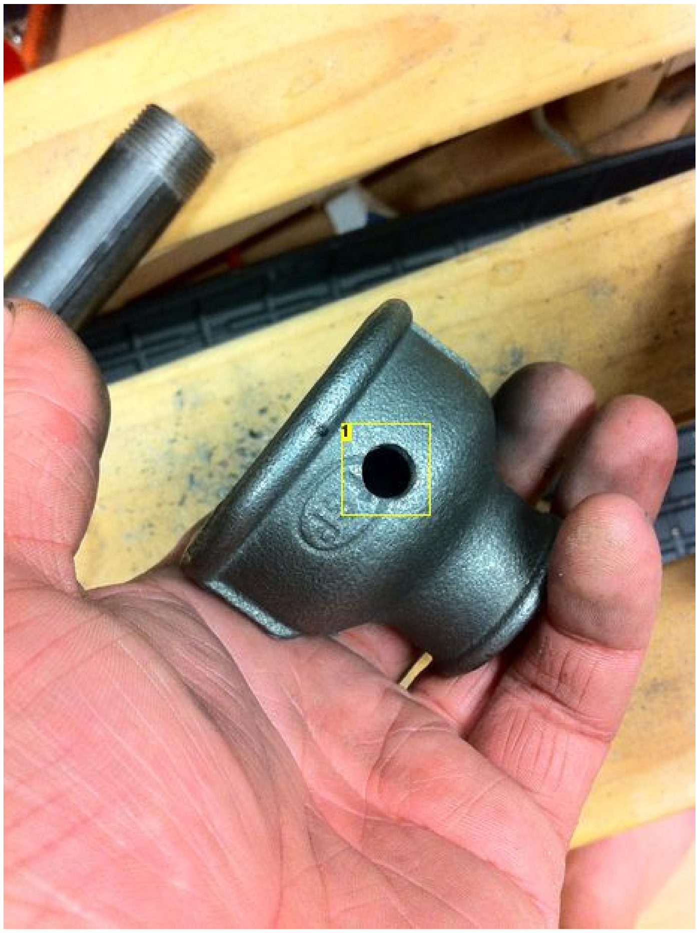


Image Notes
1. this will need to be filed so I don't cut my hands to bits.



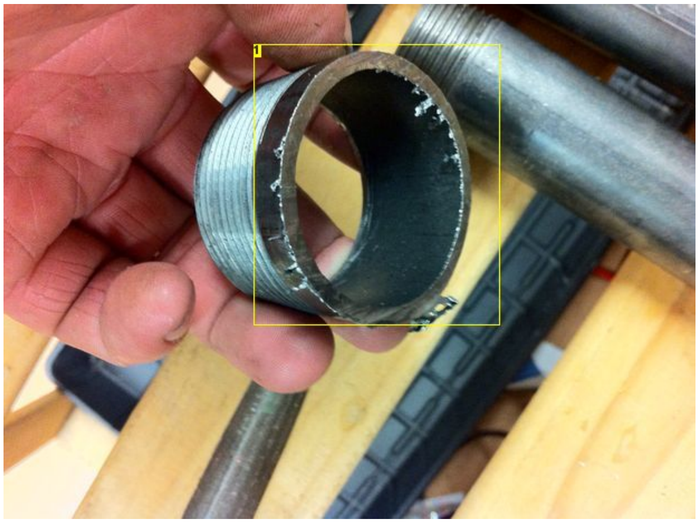


Image Notes
1. 8mm hole drilled

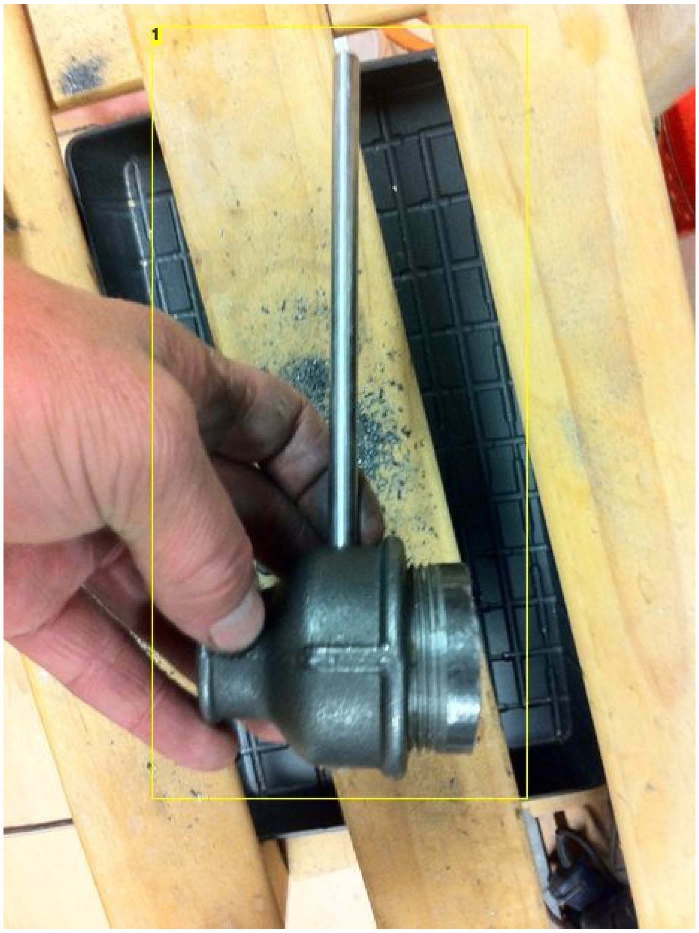


Image Notes
1. this is what it should look like assembled

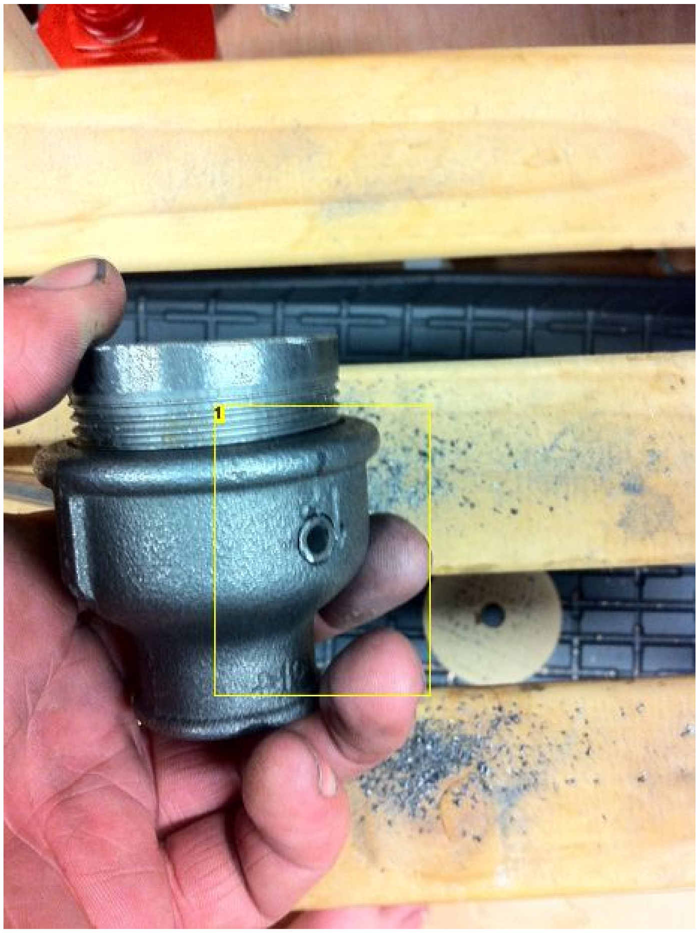


Image Notes
1. the gas feed should be flush to the hole, this was before I welded the 8mm pipe

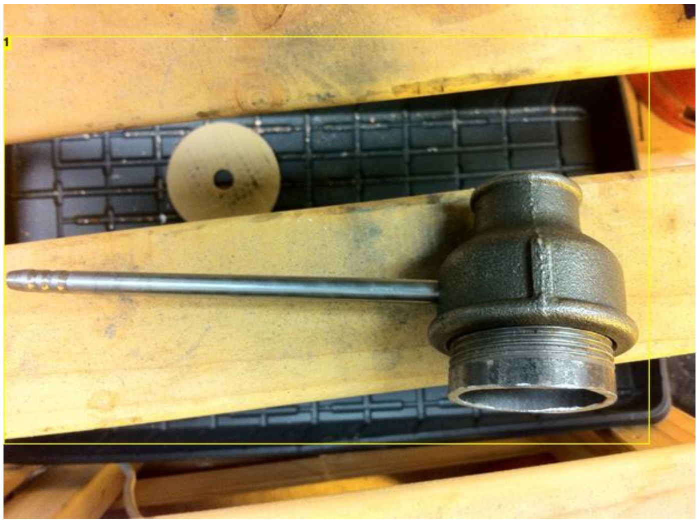


Image Notes
1. the final piece ready to be added to the burner

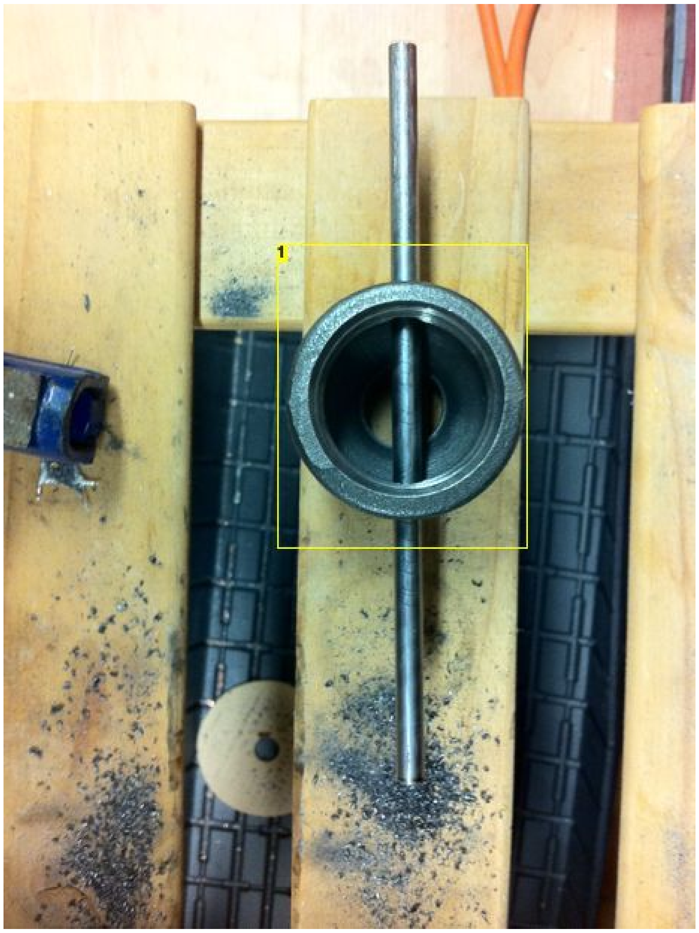
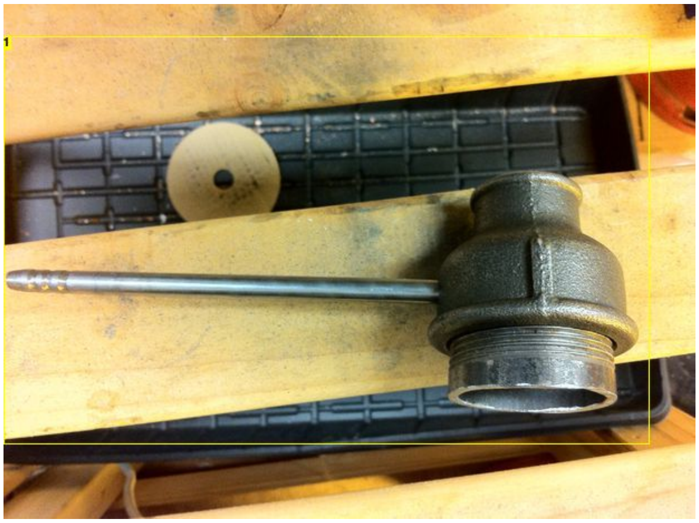


Image Notes
1. the holes are perfectly aligned



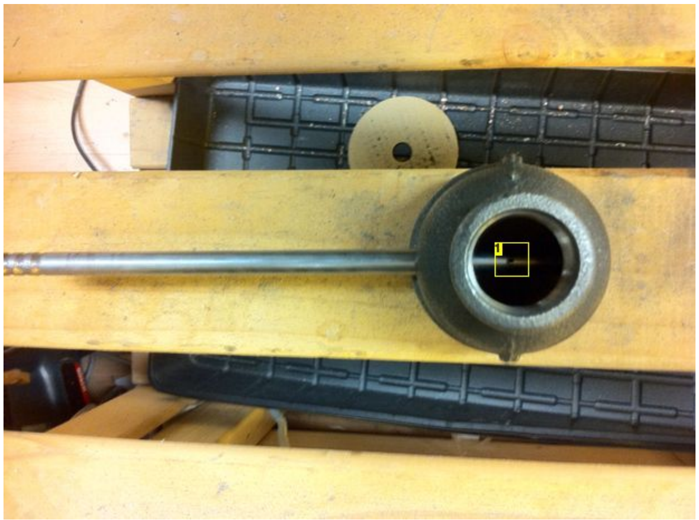


Image Notes
1. the gas hole centered

Step 5: Assemble and test

so now its just a case of putting it all together and testing it.

screw the reducer on to one end of the 3/4" pipe and slide the 1" pipe over the end, this will be really tight, i made the mistake of giving it a couple of taps with the hammer, so now its stuck on there. Opps. what you could do is put a couple of slots in the 3/4" pipe and drill a hole in the 1" pipe for a screw to hold it in place. For me I am not too worried about it being stuck it does what it needs to do so i wont be removing it.

something that is important is the position of the hole in that 8mm pipe, loosen off the pipe holding it in place, and position the hole so its facing down the length of the burner roughly centered to start with. later on we reposition it for better flow.

hook the gas up to the feed and at a low pressure turn on the gas and using a long kitchen lighter light up the burner. You should have a yellow flame, slowly turn up the gas until it starts to jet and burn blue. It may blow its self out which is ok this can be because of too much pressure so you can back the gas off. if you can't get a blue flame loosen the feed and turn it slightly so the hole is pointing up/down towards the wall of the burner, only a little though, this will help to mix the gas with the air and you should be able to achieve a nice blue flame.

a blue flame is hotter and it means that all the gas is being burned and not wasted.

here is a video of the burner working

In conclusion It would have been better to flare the nozzle as I would end up with a hotter flame as the vacuum would be greater and thus pull in more air and burn much more efficiently but for my purposes this will be fine. prehaps at a later stage I will flare the end, or build a new one with a flared end.

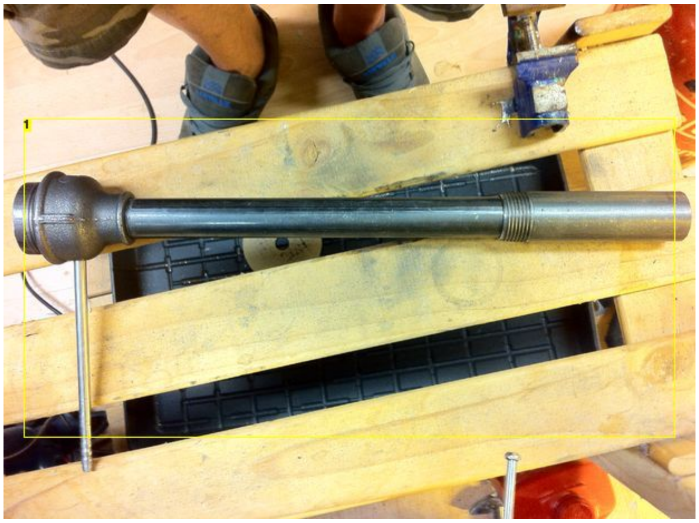


Image Notes
1. fully constructed

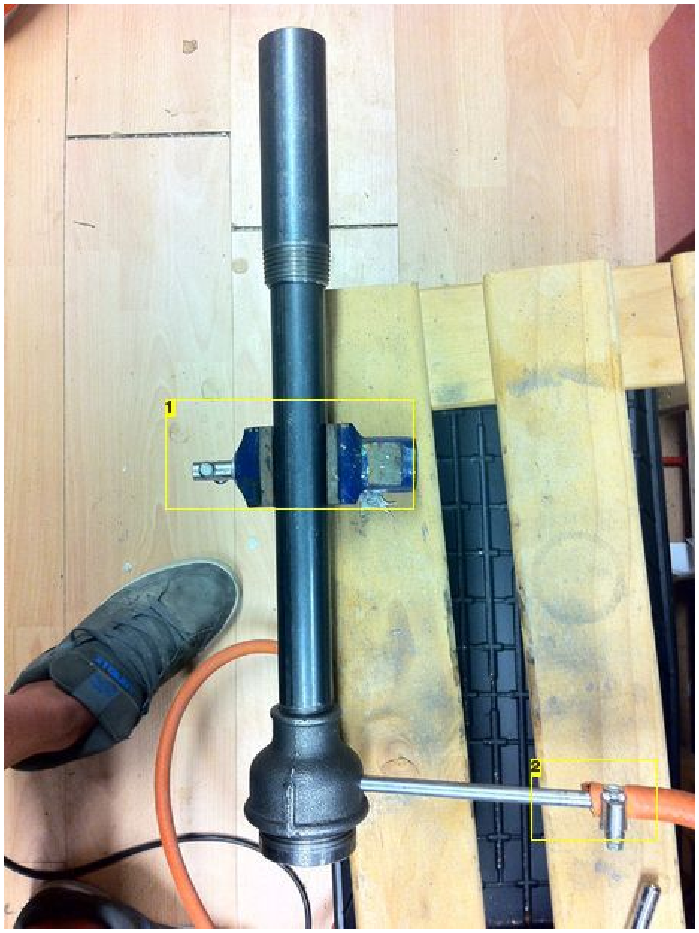


Image Notes
1. clamped the burner in a small vice so it doesn't move during testing
2. high pressure gas hose connected

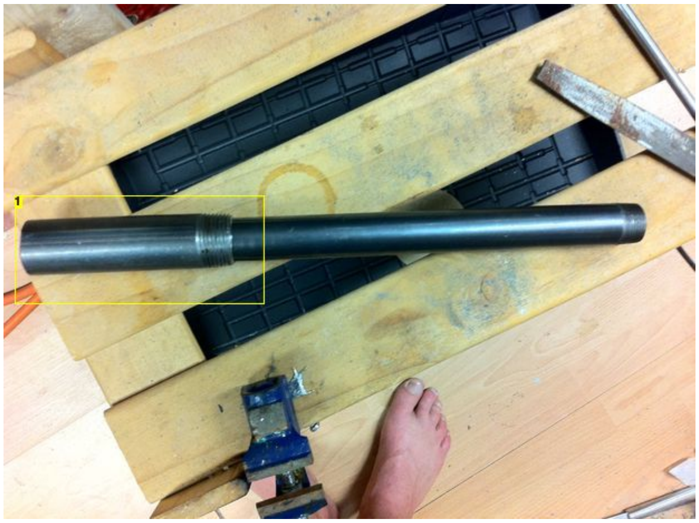
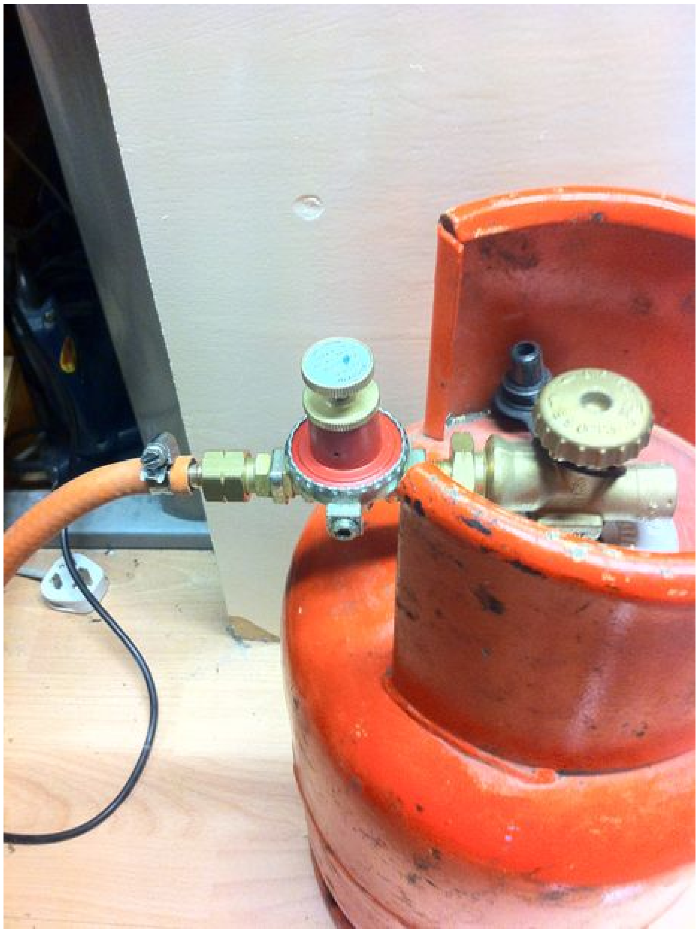
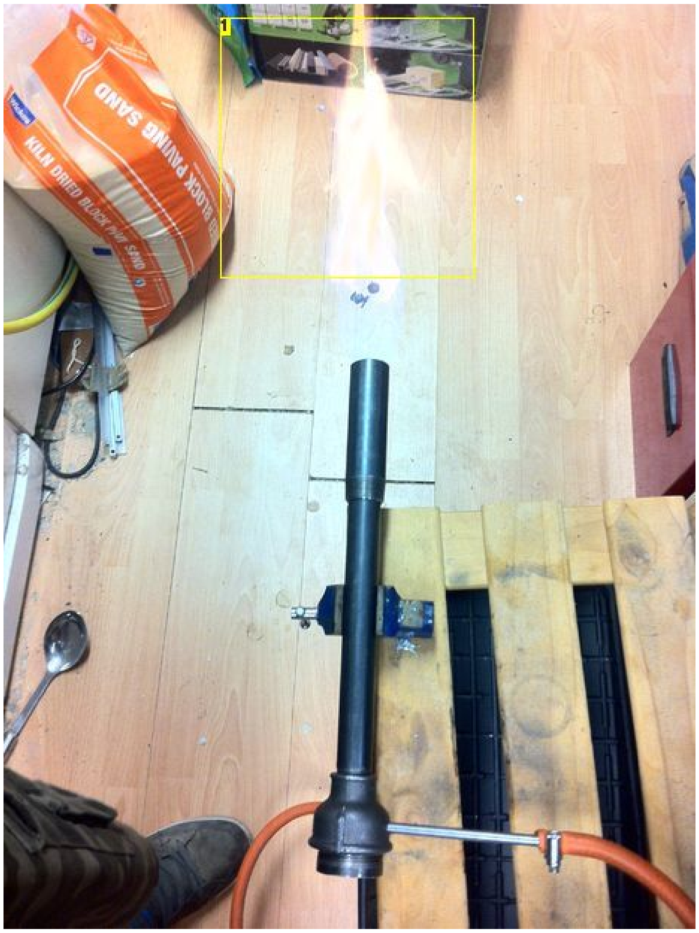


Image Notes
1. nozzle in place





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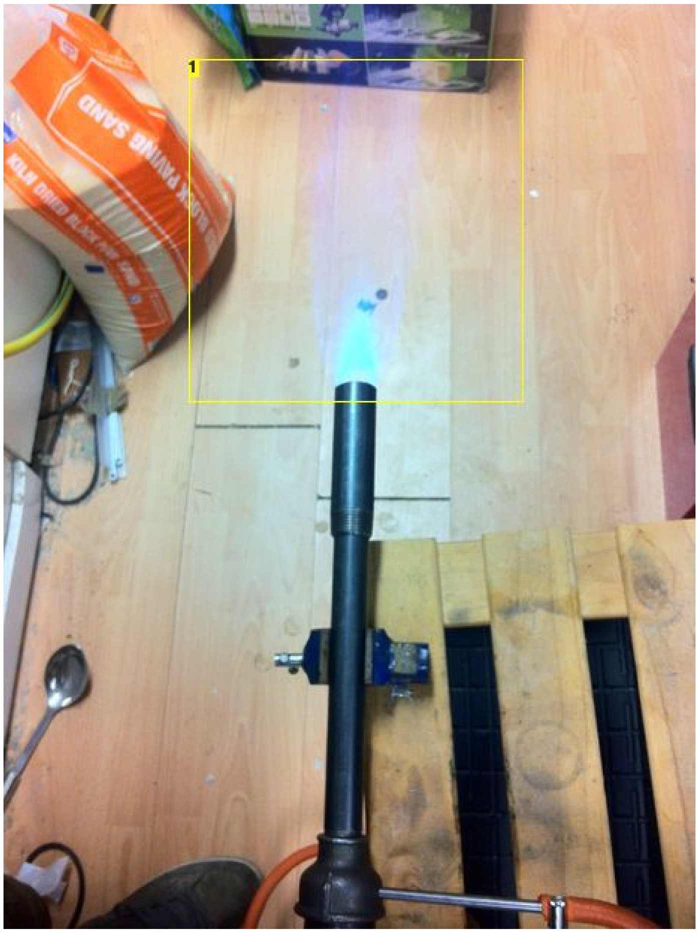

Image Notes

1. yellow flame before the gas is turned up

1. perfect blue flame, shows that all the gas is getting enough oxygen

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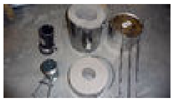

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How to Build a Forge (Gas) by makingcustomkniv

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Comments

2 comments **Add Comment**

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livichris says: Aug 13, 2014. 4:26 AM **REPLY**

have you burnt a bottle's worth of gas yet? how long did it last?

---

n1cod3mus says: Aug 13, 2014. 4:53 AM **REPLY**

I havn't been through much gas yet, I have 6kg bottle, but I havn't built the furnace yet so I couldn't say for sure.